

(21) Application No 8100506

(22) Date of filing
8 Jan 1981

(30) Priority data

(31) 3005094
(32) 12 Feb 1980

(33) Fed Rep of Germany
(DE)

(43) Application published
26 Aug 1981

(51) INT CL³ F04D 29/42

(52) Domestic classification
F1C 2B6

(56) Documents cited
GB 722677

(58) Field of search
F1C

(71) Applicant
Klein Schanzlin &
Becker
Aktengesellschaft
Postfach 225
Johann-Klein-Strasse 9
D-6710 Frankenthal
(Pfalz)
Federal Republic of
Germany

(72) Inventors
Karl-Heinz Becker
Peter Milla
Peter Hergt
Heinz-Dieter Hellmann

(74) Agents
Forrester Ketly & Co
Forrester House
52 Bounds Green Road
London N11 2EY

(54) Centrifugal pump having a double volute casing

(57) The pump has a double volute casing comprising a first volute (3), Fig. 1 (not shown), and a second volute 4 disposed opposite one another, each volute extending for at most 180° around the pump rotor 2. The second volute 4 extends to an exit opening (8) and the first volute (3) is connected with this opening (8) by way of ducts 6, 7 extending on either side of the second volute 4. The pump casing comprises a first casing part 1, in the form of a casting formed with channels defining the volutes (3), 4 and the ducts 6 and 7. In the assembled pump, the channels defining the ducts 6, 7 are covered over, on the radially inner side of the casing, by tubular inserts 9 in sealing tight engagement with the

casing part 1. The casing construction disclosed facilitates casting and subsequent finishing of the volutes and ducts.

Fig. 2

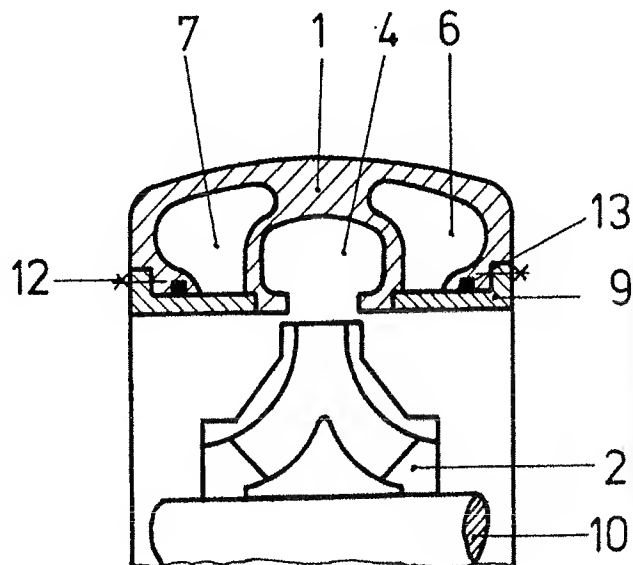


Fig. 1

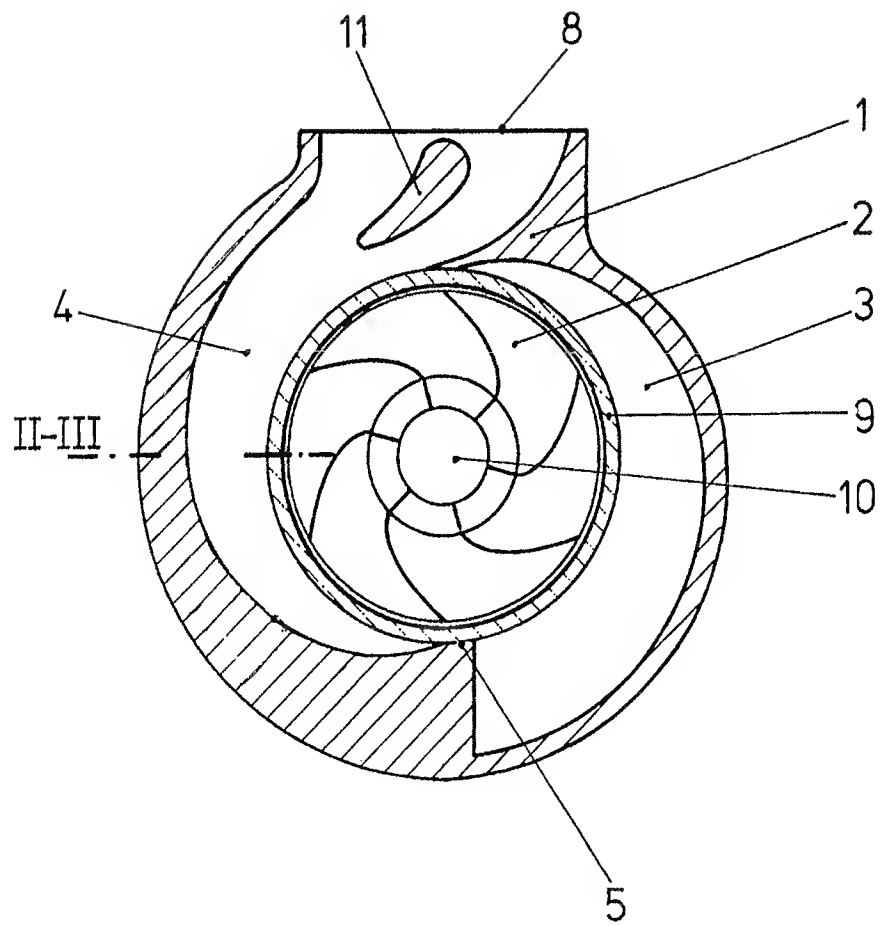


Fig. 2

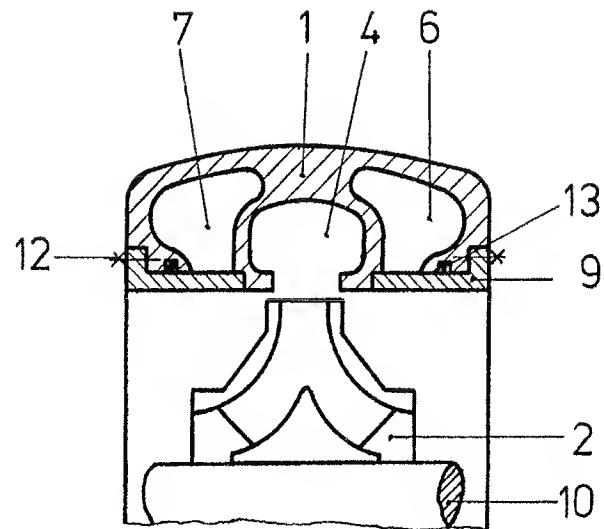
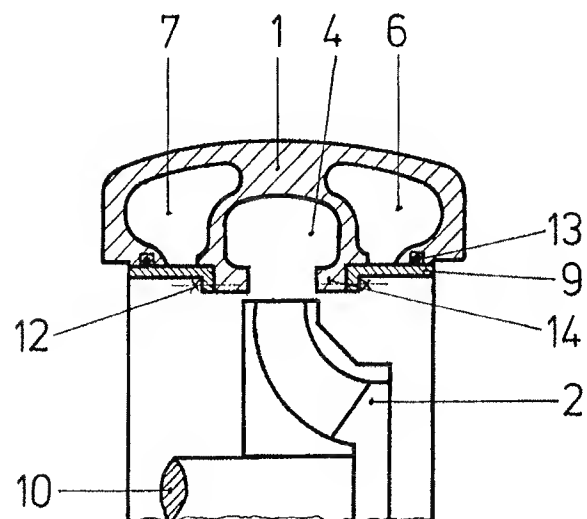


Fig. 3



SPECIFICATION

Centrifugal pump having a double volute casing

5 This invention relates to a centrifugal pump having a double volute casing comprising a first and a second volute disposed opposite one another and mechanically similar in the sense of the mechanics of similitude, each volute extending for at most 180° around the rotor or a diffuser following the same, and the outer diameter of such casing corresponding to the exit diameter of the first volute at the circumferential position of the entry of the second volute, the second volute extending to a common exit opening with which the first volute is connected with said common exit opening—by way of one or more ducts extending adjacent the second volute—from the entry of the second volute together therewith to said common exit opening.

A pump of this general character is disclosed in our co-pending patent application, corresponding to our West German Patent Application P 30 01 868.9.

A pump of the general character noted has the advantage that the double volute casing may be of substantially reduced diameter as compared with other forms of double volute casing for pumps of comparable performance. Of course a construction of this kind calls for very high quality casting techniques.

It is the object of the invention to provide an improved double volute casing pump in which the form of the casing is such as to facilitate casting and also to enable flow conditions to be improved by finishing procedures.

10 In accordance with the invention, therefore, there is provided a centrifugal pump having a rotor mounted within a double volute casing comprising a first volute and a second volute disposed opposite one another and mechanically similar in the sense of the mechanics of similitude, each of said volutes extending for at most 180° around the rotor or a diffuser following the same, and the outer diameter of such casing corresponds to the exit diameter of the first volute at the entry of the second volute, the second volute extending to a common exit opening and the first volute being connected with said common exit opening by way of one or more ducts extending, adjacent the second volute, from the entry of the second volute together therewith to said common exit opening and in which the casing comprises a first part and at least one tubular insert, said first part defining the exterior of the casing and having channels, defining said volutes and said duct or ducts, which, neglecting the or each said tubular inserts are open on a radially inner side of said first casing part which faces towards the axis of the pump rotor, the or each said tubular insert

being fitted within the first casing part concentric with the rotor, the or each said duct being bounded, on its side nearer the rotor axis, by said, or a respective said, tubular insert, and said tubular inserts being in sealing tight engagement with the first casing part.

Thus, the channels in the first casing part which define the volutes and the ducts are all accessible, so that casting is facilitated and, for instance, the coefficient of friction of the volute and of the ducts can be improved by finishing, e.g. by grinding, after casting of said first casing part and before assembly of the pump. Similarly, the fact that the double volute is accessible facilitates testing and makes it easier to clear any casting flaws. The inner members in the mould core providing the volute and duct shape can be mounted more satisfactorily, in the mould for the first casing part, so that the casting can be improved, again helping to improve flow in the finished pump and to minimise the amount of finishing machining required. The machining of such a double volute is in any case considerably facilitated.

Embodiments of the invention are described below with reference to the accompanying drawings, in which:—

95 *Figure 1* is a view in cross-section through a centrifugal pump embodying the invention,

Figure 2 is a partial view in axial section on the line II—III in Fig. 1, and

100 *Figure 3* is a view, similar to Fig. 2, showing a variant embodiment.

Referring to Fig. 1, in the centrifugal pump shown a rotor 2 is rotatable within a double volute casing which has two volutes 3, 4 supplied with liquid by the rotor 2 in operation of the pump. The first volute 3 extends through slightly less than 180° about the rotor axis and terminates at a position 5 which also marks the start of the second volute 4 which also extends through slightly less than 180° to an exit opening 8. At the place 5 the first volute 3 merges into two ducts 6, 7 which can be seen in Fig. 2. The ducts 6, 7 extend circumferentially, adjacent the second volute 4 to the common exit opening 8. The two ducts 6 and 7 and the volute 4 are spaced apart axially from one another, the volute 4 being disposed between the two ducts 6 and 7. A rib 11 is disposed in opening 8 for improved flow guidance.

120 The casing comprises a first casing part 1 which is of generally annular form, affording the exterior of the pump, a central passage to receive the pump rotor 2 and the shaft 10 on which rotor 2 is mounted, the volutes 3 and 4, the ducts 6 and 7 and the exit opening 8.

125 The volutes 3 and 4 and the ducts 6 and 7 are formed by circumferentially extending channels formed in the first casing part 1, these channels, neglecting the other parts of the pump (i.e. before the casing part 1 is

assembled with the other parts) being open on the radially inner side of the casing part 1, i.e. the side which faces towards the rotor shaft axis in the assembled pump. In the assembled pump, the channels which define the ducts 6 and 7 are covered by respective tubular inserts 9, of generally cylindrical form coaxial with the rotor and the central passage through the casing part 1, these inserts being inserted into the casing part 1 from respective axial ends and being sealed with respect to the casing part 1 by O-rings 13. The tubular inserts 9 do not, of course, extend over the channels which define the two volutes 3 and 4, these being disposed midway between the axial ends of the casing part 1, but the axial ends of the inserts 9 which are nearer one another engage annular shoulders provided by respective rebates in respective wall parts bounding the mouths of the channels defining the volutes 3 and 4. Viewed in another way, the inserts 9 are received in recesses formed (e.g. by machining) in respective end parts of a central bore through the casing part 1 which central bore receives the rotor 2. The inserts 9, in the embodiment of Fig. 2, have, at their axially outer ends, radially outwardly extending flanges through which screws or bolts 12 are passed to engage in the outer walls of the casing part 1 and secure the inserts 9 in place.

In the variant shown in Fig. 3, the radial extent of the annular shoulders in the casing part 1 against which the inner axial ends of the inserts 9 bear is substantially greater than in the embodiment of Fig. 2, and each insert has, at its inner axial end, a respective radially inwardly extending flange bearing against the respective annular shoulder and secured thereto by screws or bolts passed through the flange and screwed into the respective parts 14 of the casing part 1 which bound the mouths of the channels which define the volutes 3 and 4. The recesses, shoulders, etc. in the casing part 1 which receive and cooperate with the tubular inserts 9, may be formed during casting of the casing part 1, or at least principally so formed, or may be formed, or finished, by a subsequent machining operation (e.g. by chip removal).

In the embodiment of Figs. 1 and 2 the impeller 2 is shown as being of the so-called "double-suction" kind, wherein the impeller 2 in the embodiment of Fig. 3 is of "single-suction" kind. However, a "single-suction" impeller could equally well be used in the casing shown in Fig. 2, or a double-suction impeller in the casing shown in Fig. 3.

60 CLAIMS

1. A centrifugal pump having a rotor mounted within a double volute casing comprising a first volute and a second volute disposed opposite one another and mechanically similar in the sense of the mechanics of

simplitude, each of said volutes extending for at most 180° around the rotor or a diffuser following the same, and the outer diameter of such casing corresponds to the exit diameter of the first volute at the entry of the second volute, the second volute extending to a common exit opening and the first volute being connected with said common exit opening by way of one or more ducts extending, adjacent the second volute, from the entry of the second volute together therewith to said common exit opening, and in which the casing comprises a first part and at least one tubular insert, said first part defining the exterior of the casing and having channels, defining said volutes and said duct or ducts, which, neglecting the or each said tubular insert are open on a radially inner side of said first casing part which faces towards the axis of the pump rotor, the or each said tubular insert being fitted within the first casing part concentric with the rotor, the or each said duct being bounded, on its side nearer the rotor axis, by said, or a respective said, tubular insert, and said tubular inserts being in sealing tight engagement with the first casing part.

2. A centrifugal pump according to claim 1, wherein the first volute is connected with said common exit opening by way of two ducts which are spaced from one another and from said second volute in a direction parallel with the rotor axis, so as to lie on opposite sides of the second volute, the radially inner mouths of the channels in the first casing part which define said ducts being similarly spaced axially from one another and from the second volute, and wherein there are two said tubular inserts in sealing-tight engagement with the first casing part, and co-axial with the rotor each said tubular insert bounding a respective one of the two ducts on the side of the duct nearer the rotor axis.

3. A centrifugal pump substantially as hereinbefore described with reference to, and as shown in, Figs. 1 and 2 of the accompanying drawings.

4. A centrifugal pump substantially as hereinbefore described with reference to, and as shown in, Fig. 3 of the accompanying drawings.

5. Any novel feature or combination of features described herein.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd.—1981.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.